



Supplement of

Soil organic carbon stocks did not change after 130 years of afforestation on a former Swiss Alpine pasture

Tatjana C. Speckert et al.

Correspondence to: Tatjana C. Speckert (tatjanacarina.speckert@geo.uzh.ch)

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Table S1. Bulk density of mineral soil samples (n= 5 for pasture; n= 3 for forest). Values are average \pm SE (**Average \pm SE of the individual plots; n= 5 for pasture; n= 3 for forest).

Mineral soil	Bulk density [g cm ⁻³]			
	Pasture	Forest		
		40-year-old	55-year-old	130-year-old
0-5cm	0.87 \pm 0.04	0.76 \pm 0.02	0.83 \pm 0.09	0.86 \pm 0.04
5-10cm	0.95 \pm 0.03	0.86 \pm 0.03	0.90 \pm 0.07	0.83 \pm 0.07
10-15cm	1.00 \pm 0.02	1.04 \pm 0.01	1.04 \pm 0.02	1.04 \pm 0.04
15-20cm	1.05 \pm 0.04	1.11 \pm 0.04	1.11 \pm 0.06	1.14 \pm 0.02
20-25cm	1.12 \pm 0.03	1.17 \pm 0.03	1.11 \pm 0.04	1.19 \pm 0.03
25-30cm	1.12 \pm 0.03	1.28 \pm 0.00	1.17 \pm 0.04	1.25 \pm 0.05
30-35cm	1.15 \pm 0.04	1.22 \pm 0.00	1.22 \pm 0.02	1.26 \pm 0.04
35-40cm	1.14 \pm 0.06	1.20 \pm 0.00	1.24 \pm 0.01	1.21 \pm 0.05
40-45cm	1.16 \pm 0.06	1.18 \pm 0.00	1.19 \pm 0.03	1.23 \pm 0.02
**Average	1.05 \pm 0.02	1.08 \pm 0.04	1.09 \pm 0.03	1.10 \pm 0.03

Table S2. Composition of the Oi horizon of each forest age (40-, 55-, and 130-years-old; n.a. = not available).

Residues [mass - %]	40-year-old forest	55-year-old forest	130-year-old forest
Branches	24.0	16.4	16.2
Spruce cones	32.5	64.3	58.2
Spruce needles	24.5	3.9	7.5
Moss	1.2	n.a.	0.2
Grass residues	n.a.	n.a.	2.3
Arbuscular mycorrhiza	4.3	n.a.	n.a.

Table S3. Root biomass and root frequency (counted in the field) of pasture and forest areas (40-, 55-, and 130-years old). Values are mean values \pm SE (n= 5 for pasture; n= 3 for forest, * Sum \pm SE (0-45cm) (n.a. = not available).

Mineral soil	Fine (0-2mm) root biomass [g m ⁻²]				Coarse (2-5mm) root biomass [g m ⁻²]			
	Pasture	Forest			Pasture	Forest		
		40-year-old	55-year-old	130-year-old		40-year-old	55-year-old	130-year-old
0-5cm	87.7 \pm 26.9	1.3 \pm 0.4	1.4 \pm 0.4	0.7 \pm 0.2	55.2 \pm 20.9	225.4 \pm 62.9	135.6 \pm 21.5	178.1 \pm 81.1
5-10cm	27.2 \pm 10.5	4.8 \pm 3.6	0.4 \pm 0.3	2.9 \pm 1.9	197.9 \pm 183.0	117.0 \pm 32.1	78.3 \pm 15.0	222.3 \pm 61.1
10-15cm	19.6 \pm 3.6	4.6 \pm 1.9	0.9 \pm 0.8	3.4 \pm 3.1	189.0 \pm 131.5	74.8 \pm 17.5	40.3 \pm 10.8	77.4 \pm 26.7
15-20cm	38.0 \pm 23.1	2.2 \pm 1.2	n.a.	3.3 \pm 2.6	5.8	87.5 \pm 58.8	59.3 \pm 7.6	80.4 \pm 61.9
20-25cm	3.5 \pm 0.9	2.5 \pm 1.5	0.1	0.2 \pm 0.1	27.8	15.6 \pm 3.8	13.7 \pm 2.9	18.0 \pm 11.9
25-30cm	4.3 \pm 0.9	0.5 \pm 1.2	0.1	1.1 \pm 0.6	27.4 \pm 22.1	59.8 \pm 18.7	16.8 \pm 9.1	13.3 \pm 6.4
30-35cm	3.5 \pm 1.2	0.4 \pm 0.0	n.a.	0.9 \pm 0.4	96.8	34.6 \pm 3.8	4.8 \pm 0.2	32.3 \pm 17.5
35-40cm	1.4 \pm 0.4	0.3	n.a.	1.0 \pm 0.1	n.a.	16.7 \pm 0.1	2.8 \pm 0.9	36.0 \pm 11.9
40-45cm	1.7 \pm 0.6	n.a.	n.a.	1.1 \pm 0.8	n.a.	22.2 \pm 10.5	4.1 \pm 2.6	34.0 \pm 22.7
*Sum	184.9 \pm 39.5	16.1 \pm 6.1	2.9 \pm 1.4	12.1 \pm 7.5	274.2 \pm 209.2	640.7 \pm 140.4	349.5 \pm 31.3	683.5 \pm 202.1
Mineral soil	Fine (0-2mm) root frequency [m ⁻²]				Coarse (2-5mm) root frequency [m ⁻²]			
	Pasture	Forest			Pasture	Forest		
		40-year-old	55-year-old	130-year-old		40-year-old	55-year-old	130-year-old
0cm	7'478.4 \pm 1'150.6	1'924.0 \pm 285.2	880.0 \pm 36.7	845.3 \pm 201.6	n.a.	717.3 \pm 22.8	870.7 \pm 264.7	334.7 \pm 116.9
10cm	5'079.2 \pm 736.5	854.7 \pm 212.5	541.3 \pm 121.8	910.7 \pm 141.6	n.a.	438.7 \pm 22.5	366.7 \pm 67.7	545.3 \pm 61.5
20cm	2'991.2 \pm 759.9	610.7 \pm 22.7	368.0 \pm 49.1	469.3 \pm 89.3	n.a.	276.0 \pm 22.8	233.3 \pm 58.3	320.0 \pm 22.8
30cm	1'229.6 \pm 339.0	436.0 \pm 80.9	129.3 \pm 2.2	346.7 \pm 87.7	n.a.	310.7 \pm 42.5	141.3 \pm 19.4	264.0 \pm 60.7
40cm	1'729.0 \pm 814.5	1'646.0	98.7 \pm 23.3	68.0 \pm 13.2	n.a.	628.0 \pm 202.7	88.0 \pm 22.3	168.0 \pm 42.8
*Sum	15'761.3 \pm 4'422.4	5'320.0 \pm 623.8	2'017.3 \pm 151.3	2'640.0 \pm 504.9	n.a.	2'370.7 \pm 225.6	1'700.0 \pm 377.9	1'632.0 \pm 260.8

Table S4. Obtained t- and p-values from the liner-mixed model (*nmle* package) for SOC and TN stock in relation to soil depth and different forest age.

Mineral soil depth	SOC stock [kg m ⁻²]		TN stock [kg m ⁻²]	
	t-value	p-value	t-value	p-value
0-5cm	-1.33	2.05e ⁻¹⁷	-1.51	0.089
5-10cm	-1.37	0.174	-0.34	0.025
10-15cm	-4.30	4.02e ⁻⁰⁵	-1.55	0.123
15-20cm	-5.30	7.08e ⁻⁰⁷	-2.58	0.011
20-25cm	-5.26	8.49e ⁻⁰⁷	-3.33	0.001
25-30cm	-5.24	9.36e ⁻⁰⁷	-3.13	0.002
30-35cm	-6.07	2.40e ⁻⁰⁸	-4.38	3.24e ⁻⁰⁴
35-40cm	-7.07	2.33e ⁻¹⁰	-5.41	2.2e ⁻⁰⁶
40-45cm	-7.17	1.44e ⁻¹⁰	-5.59	1.0e ⁻⁰⁷

Table S5. Obtained t- and p-values from the liner-mixed model (*nmle* package) for the $\delta^{13}\text{C}$ values as well as for the C:N ratio in the mineral soil in relation to soil depth and different forest age. In bold is the significant change in the $\delta^{13}\text{C}$ values in the subsoil (30-45cm) of the different forest ages, as well as the change in the C:N ratio between 10 and 20cm (mentioned in the discussion) of the different forest ages.

Mineral soil depth	$\delta^{13}\text{C}$ [‰ V-PDB]		C:N ratio	
	t-value	p-value	t-value	p-value
0-5cm	2.06	0.108	13.23	1.57e ⁻²³
5-10cm	0.52	0.607	-0.20	0.842
10-15cm	2.42	0.017	-2.61	0.011
15-20cm	1.87	0.065	-2.83	0.006
20-25cm	2.87	0.005	-1.93	0.057
25-30cm	3.14	0.002	-2.15	0.034
30-35cm	4.17	7.0e-05	-1.75	0.083
35-40cm	4.51	2.0e-05	-2.05	0.043
40-45cm	5.88	3.0e-07	-1.56	0.121